AN ASSESSMENT OF NUTRITIVE VALUE, RARITY AND CONSERVATION OF *MONSONIA HELIOTROPIOIDES* (CAV.) BOISS. — A THREATENED PLANT OF NORTH-WEST RAJASTHAN, INDIA

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Monsonia heliotropioides (Mayur Shikha) is a rare herbaceous fodder plant of north-west Rajasthan whose population has been continuously decreasing. It was observed only from a few localities having calcarious cankar land with a very scanty population. Protection of habitat may be an effective control measure for the conservation of this species. From the leaves 23.77% crude proteins, 58.79% carbohydrates, 5.36% crude fat and only 5.89% crude fibres were estimated. All plant parts had an appreciable amount of minerals. Tannins were present in all the parts with a maximum concentration in leaves, whereas alkaloids and saponins were not detected. Seed germination was observed only under mechanical scarification. Besides poor germination percentage other reason observed for rarity, were specific habitat and its disappearance, easy grazing of whole umbellate inflorescence consequently low seed production and dispersal mechanism of fruit.

Key words: *Monsonia heliotropioides*, threatened plant, nutritive value, rarity, germination, habitat, conservation

INTRODUCTION

Existence of a plant species may be necessary for maintenance and balance of the ecosystem. So, throughout the globe, conservation of biodiversity is one of the most urgent needs. The primary tool for biodiversity conservation is derived from the analysis of basic taxonomic and phytogeographic data, which defines the centres of endemism and species diversity (Kiran Raj 2010). North-west Rajasthan forms an important part of the Great Indian Desert. In the recent past, many areas of this region were subjected to considerable ecological changes, which has modified the pattern and abundance of many species, consequently a number of plant species have become threatened. Only a few attempts have been made to study the plants of this region (Sahni 1970; Pandey *et al.* 1983; Harsh and Tiwari 1998).

The threatened status of a plant species can be assessed from its population distribution, regeneration capacity and present trends of exploitation pressure on such species (Lucas and Synge 1978; Jain and Sastry 1980; Nayar and Sastry 1987, 1988, 1990; Ali 2010). *Monsonia heliotropioides* (Cav.) Boiss. is an annual herb with woody root stock and radical leaves; it belongs to the Family Geraniaceae (Bhandari 1990). A rare plant of north-west Rajasthan, it is reported from a very few localities, having calcarious canker land. It is a good fodder plant and also used as a valuable remedy in acute and chronic dysentery, especially of use in ulceration of the lower part of the intestine (Leyel 1981). Desert plants are generally rich in nutritive contents, especially proteins (Mathur and Karwasra 1967; Purohit 1987; Singh and Singh 2011). Efforts for conserving plants can be improved if the species selected are thoroughly investigated for their use, since multiple uses of any plant can motivate people for its conservation. Therefore, during the present investigation besides studying the causes of rarity and conservation measures, the fodder value of plant was also assessed.

MATERIAL AND METHODS

Field trips were regularly made to different localities in the study area to study the distribution, habitat, phenology since 1998 and information was also sought from locals regarding utility, low population, rarity and present trends of exploitation pressure on the species. Various aspects of threat were studied on the basis of criterion given by Perring and Farwell (1977).

For the estimation of nutritive content, methods of AOAC (1990) were used. Mineral content was estimated by the Atomic Absorption Spectrophotometer (AAS) method. The qualitative estimation of alkaloids, saponins and tannins were made by the method of Amar Singham *et al.* (1964) and Arthur and Chan (1962).

Seed germination study was performed in earthen pots filled with soil collected from the habitat the plant grew, under controlled conditions and various treatments.

RESULTS AND DISCUSSION

Monsonia heliotropioides is regarded as a good fodder plant for cattle in the area due to palatability and nutritive

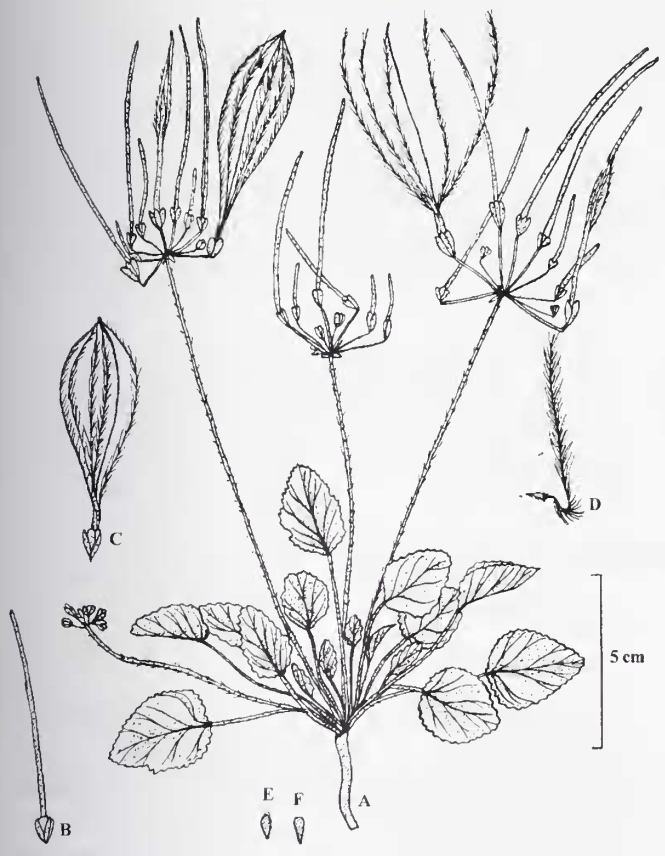

Fig. 1: *Monsonia heliotropioides* (Cav.) Boiss
A: Habit; B: Fruit, C. Dehiscing fruit; D: Mericarp with bristle;
E: sepal; F. Petal

value. The distributional range of this species was found to be very restricted with scanty population. The main causes of depletion of this species observed during the study were shrinkage of grazing lands, uncontrolled grazing and destruction of habitat by locals for collecting calcarious cankers used mainly for construction purpose. *Prosopis juliflora*, which regenerates faster and grows aggressively, is seriously threatening the survival of indigenous species in north-west Rajasthan (Singh and Singh 2011). Britto *et al.* (2002) observed that habitat degradation was the main cause of threat for *Ceropegia* sp. and suggested that they have genetically depleted and are scarcely available.

M. heliotropioides in its vegetative stage has prostrate radical leaves. During the reproductive period it bears inflorescence on long erect peduncle; the length of peduncle is about twice during fruit formation. The fruits are easily grazed as they are long beaked and umbellate, like the crown of a peacock (hence the local name Mayur Shikha). The fruit dehisces into small mericarps with long hairy bristles, which enables it to disperse widely by wind through long distances and habitats where the conditions may not be suitable for its seed germination and consequently growth, as a result of which a large number of seeds are destroyed. This is the main reason for its rare occurrence and small population.

Analysis of the plant parts showed that *Monsonia heliotropioides* contains high crude proteins, which are maximum in leaves (23.77%) and minimum in roots (9.58%) (Table 1). Adequate amount of nitrogen supply help to maintain normal metabolism under water and heat stress, one of the major factor for all plants in arid regions (Hellmuth 1968). Crude fibres were higher in root and fruit than leaves. The high percentage of crude fibres in fruits may be due to the presence of long beak in fruits and bristles in mericarps. Total ash content was comparatively very low in fruits. Total carbohydrate was estimated to be lower in leaves (58.79%) than roots (76.5%) and fruits (79.4%). All the plant parts showed a good amount of mineral nutrients, especially phosphorus, manganese and zinc. High fodder value of this plant is clearly evident from the present biochemical analysis particularly of high proteins and mineral contents. High concentration of mineral elements in medicinal plants act not only as curative, but also as preventive agents for many diseases (Pandey *et al.* 2006). Qualitative test for alkaloids, tannins and saponins revealed that tannins were present in all the parts with comparatively dense precipitation in leaf extract. Tannins have astringent properties, which hastens the healing of wounds and inflamed mucous membrane (Okwu and Okwu 2004). High amount of tannins in leaves reported

Table 1: Nutritive content in different parts of *Monsonia heliotropioides* (on % dry matter basis)

Nutritive contents	Roots	Leaves	Fruits
Crude Protein	9.58 ±0.92	23.77 ±1.60	11.16 ±1.02
Crude Fat	0.83 ±0.52	5.36 ±0.21	3.21 ±0.28
Crude Fibre	23.85 ±1.48	5.89 ±0.59	22.50 ±1.13
Ash	13.09 ±1.36	12.08 ±0.25	6.23 ±0.46
Nitrogen Free Extract	52.65 ±2.06	52.90 ±2.23	56.90 ±1.99
Organic Matter	86.91 ±2.18	87.92 ±1.74	94.21 ±1.29
Total Carbohydrate	76.50 ±1.93	58.79 ±1.18	79.40 ±1.45
Calcium	0.77 ±0.12	1.01 ±0.14	1.15 ±0.16
Phosphorus	1.27 ±0.18	0.95 ±0.15	1.69 ±0.58
Magnesium*	101 ±0.82	128 ±1.77	111 ±1.38
Copper*	2.7 ±0.18	3.1 ±0.20	2.1 ±0.44
Iron*	42.7 ±2.22	48.7 ±0.77	34.2 ±0.69
Zinc*	3.8 ±0.21	2.4 ±0.20	3.2 ±0.16
Manganese*	3.4 ±0.28	4.4 ±0.42	6.7 ±0.40

values are mean ±S.D. of five samples
* mg/100 gdw

in present study justify its medicinal value in dysentery and ulceration of intestine. Alkaloids and saponins were not observed. These substances play an important role in ecology and physiology of adaptations, but may sometimes cause negative effect on grazing animals in case of higher concentration. High concentration of saponins in fodder plants may cause foaming in intestinal tract of grazing animals, which lead to bloating in cattle.

Germination of seeds was observed only under the treatment of mechanical scarification, which was very poor (30%). There was no effect of acid scarification, Indole Acetic acid and Gibbrellic acid on germination of seeds. Seed germination was epigeal although the seed coat remains inside the soil due to the attachment at the lower part of hypocotyl. It has been concluded that hard seed coat is impermeable for water and gases, and requires partial decomposition before germination.

Protection of habitat, control on grazing, introduction in area of similar habitat and ecological condition and maintenance of its seeds in seed banks, replacing them with fresh collection every year, as seeds gradually lose viability under storage, may be important conservation measures for this species.

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